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D180-19491-1

ADDENDUM TO

SEMICONDUCTOR FAILURE MODEL STUDY

Final Report

MAY 1976

CONTRACT F29601-76-C-0061

Research & Engineering Division
Boeing Aerospace Company

UNCLASSIFIED

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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

SUPERSAP2
EMP
Semiconductor
Damage Constant

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report presents the results of a limited preliminary study to obtain methodology for failure modeling of transistors and diodes for use in electromagnetic pulse vulnerability studies on aerospace electronic systems. The report describes the methodology and presents data and analysis to document the model.

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ADDENDUM TO

SEMICONDUCTOR FAILURE MODEL STUDY

This document presents the supplemental data for the Semiconductor Failure Model Study (D180-19491-1).

Table 1 presents a computer listing of the SUPERSAP2 transistor experimental data used for the study.

Table 2 presents a computer listing of the SUPERSAP2 diode experimental data.

Tables 3, 4, 5, and 6 present original copies of the four HP 9820 Calculator programs used to prepare the data plots. The programs are identified as "TR-K/V," "TR-LEG," "DI-K/V," and "DI-LEG." The operation of the programs is described in Section 2 of the basic report.

Table 1

SUPERSAP2 TRANSISTOR EXPERIMENTAL DATA

NUMBER	1N1055	1N1039	2N1039	2N1115	2N1115A
VENDOR	WESY	TIT	DEL	ETC	TEC
FUNCTION	BJTSN	BJTGP	BJTGP	BJTGP	BJTSN
STRUCTURE	E.	AL.		AL.	
PACKAGE	THREAD	CASE1	TO36	CASE1	TO5
POWER	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RISETIME	0.	0.	0.	0.	0.
WUNSCH	1.600E+00	1.400E+00	1.000E+00	3.800E-01	9.800E-01
CURRENT	0.	0.	0.	0.	0.
GAIN	0.	0.	0.	0.	0.
DATA	M-01	M-01	M-01	M-01	M-01
REFERENCE	BASE	BASE	BASE	BASE	BASE
INPUT	EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
INVOLT	6.000E+00	2.000E+01	4.000E+01	1.000E+01	6.000E+00
INZ	0.	0.	0.	0.	0.
INZBLKS	0.	0.	0.	0.	0.
INZBLK50	0.	0.	0.	0.	0.
INCASETR	0.	0.	0.	0.	0.
INAMBTR	0.	0.	0.	0.	0.
INJUNCAP	0.	0.	0.	0.	0.
INMODELF					
INKF1	0.	0.	0.	0.	0.
INKF2	0.	0.	0.	0.	0.
INMODELR	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
INKR1	1.600E+00	1.400E+00	1.000E+00	3.800E-01	9.800E-01
INKR2	0.	0.	0.	0.	0.
OUTPUT	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR
OUTVOLT	1.200E+02	6.000E+01	8.000E+01	2.000E+01	6.000E+01
OUTZBLKS	0.	0.	0.	0.	0.
OUTZBLK50	0.	0.	0.	0.	0.
OUTCASETR	0.	0.	0.	0.	0.
OUTAMBTR	0.	0.	0.	0.	0.
OUTJUNCAP	0.	0.	0.	2.000E+01	0.
OUTMODELF					
OUTKF1	0.	0.	0.	0.	0.
OUTKF2	0.	0.	0.	0.	0.
OUTMODELR					
OUTKR1	0.	0.	0.	0.	0.
OUTKR2	0.	0.	0.	0.	0.

Table 1 (Continued)

2N1118	2N1132	2N1469	2N1485	2N1486
SPR	FSC	SOD	SEN	SEN
BJTSP	BJTSP	BJTSP	BJTSN	BJTSN
AL.PL	D.	AL.	PL.D	PL.D
TO5	TO39	TO5	TO8	TO8
0.	0.	2.500E-01	2.500E+01	2.500E+01
0.	0.	0.	1.200E+00	1.200E+00
0.	0.	0.	0.	0.
1.900E-01	2.300E-01	6.500E-01	2.380E+00	1.560E+00
0.	0.	0.	3.000E+00	3.000E+00
0.	0.	0.	0.	0.
M-04	M-01	M-01	M-12	M-12
BASE	BASE	BASE	BASE	BASE
EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
1.000E+01	5.000E+00	4.000E+00	1.200E+01	1.200E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	5.700E+01	0.	0.	0.
	WUNSCH			
0.	2.000E+00	0.	0.	0.
0.	0.	0.	0.	0.
WUNSCH	WUNSCH	WUNSCH	EXPO	EXPO
1.900E-01	2.300E-01	6.500E-01	1.560E-04	1.850E-01
0.	0.	0.	1.170E+00	6.520E-01
COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR
2.500E+01	5.000E+01	4.000E+01	6.000E+01	1.000E+02
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	7.040E+00	7.040E+00
0.	0.	0.	0.	0.
6.000E+00	3.100E+01	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
			WUNSCH	EXPO
0.	0.	0.	1.010E+00	2.860E+02
0.	0.	0.	0.	1.060E-01

Table 1 (Continued)

NUMBER	2N1556	2N1562	2N1642	2N176	2N1777A
VENDOR	TII	TEC	CRY	MOTA	GESY
FUNCTION	SCR	SCR	BJTSP	BJTGP	SCR
STRUCTURE	PL.			ME.	
PACKAGE	TO5	TO64	TO5	TO3	TO64
POWER	0.	0.	0.	9.000E+01	0.
FREQUENCY	0.	0.	0.	7.000E+00	0.
RISETIME	0.	0.	0.	0.	0.
WUNSCH	9.400E-01	4.000E-01	1.300E-01	1.010E+00	4.000E+00
CURRENT	0.	0.	0.	3.000E+00	0.
GAIN	0.	0.	0.	0.	0.
DATA	M-01	M-01	M-01	M-03	M-02
REFERENCE	BASE	BASE	BASE	BASE	BASE
INPUT	EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
INVOLT	1.000E+02	0.	0.	0.	0.
INZ	0.	0.	0.	0.	0.
INZBLK5	0.	0.	0.	0.	0.
INZBLK50	0.	0.	0.	0.	0.
INCASETR	3.130E+01	0.	0.	0.	0.
INAMBTR	0.	0.	0.	0.	0.
INJUNCAP	0.	0.	0.	0.	0.
INMODELF				WUNSCH	
INKF1	0.	0.	0.	3.000E+00	0.
INKF2	0.	0.	0.	0.	0.
INMODELR	WUNSCH	WUNSCH	WUNSCH	EXPO	WUNSCH
INKR1	9.400E-01	4.000E-01	1.300E-01	3.330E+00	4.000E+00
INKR2	0.	0.	0.	4.200E-01	0.
OUTPUT	COLLECTOR		COLLECTOR	COLLECTOR	
OUTVOLT	1.000E+01	0.	3.000E+01	4.000E+01	0.
OUTZBLK5	0.	0.	0.	0.	0.
OUTZBLK50	0.	0.	0.	0.	0.
OUTCASETR	0.	0.	0.	8.330E-01	0.
OUTAMBTR	0.	0.	0.	0.	0.
OUTJUNCAP	0.	0.	0.	0.	0.
OUTMODELF				WUNSCH	
OUTKF1	0.	0.	0.	1.110E+01	0.
OUTKF2	0.	0.	0.	0.	0.
OUTMODELR				WUNSCH	
OUTKR1	0.	0.	0.	9.580E-01	0.
OUTKR2	0.	0.	0.	0.	0.

Table 1 (Continued)

2N1893	2N190	2N2102	2N2222	2N2222
FSC	ETC	NSC	FSC	FSC
BJTSN	BJTGP	BJTSN	BJTSN	BJTSN
D.PL	AL.	D.	PL.E	PL.E
TO5	CASE1	TO5	TO18	TO18
0.	0.	1.000E+00	0.	0.
0.	0.	0.	2.500E+02	2.500E+02
0.	0.	0.	0.	0.
4.000E-01	5.800E-01	4.590E-01	8.000E-02	1.100E-01
0.	0.	1.000E+00	8.000E-01	8.000E-01
0.	0.	0.	0.	0.
M-02	M-04	M-12	M-01	M-02
BASE	BASE	BASE	BASE	BASE
EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
7.000E+00	0.	7.000E+00	5.000E+00	5.000E+00
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	8.330E+01	8.330E+01
0.	0.	0.	3.000E+02	3.000E+02
0.	0.	0.	0.	0.
			WUNSCH	
0.	0.	0.	6.000E-01	0.
0.	0.	0.	0.	0.
WUNSCH	WUNSCH	EXPO		WUNSCH
4.000E-01	5.800E-01	1.970E-02	0.	8.200E-02
0.	0.	7.210E-01	0.	0.
COLLECTOR		COLLECTOR	COLLECTOR	COLLECTOR
1.200E+02	0.	1.200E+02	6.000E+01	6.000E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	1.750E+02	0.	0.
0.	0.	0.	8.000E+00	8.000E+00
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
		WUNSCH		
0.	0.	4.710E-01	0.	0.
0.	0.	0.	0.	0.

Table 1 (Continued)

NUMBER	2N2346	2N2483	2N2857	2N2894	2N2906
VENDOR	GESY	FSC	MOTA	RAYN	MOTA
FUNCTION	SCR	BJTSN	BJTSN	BJTSP	BJTSP
STRUCTURE		NB	PL.D	PL.D	
PACKAGE	TO5	TO18	TO72	TO18	TO18
POWER	0.	3.600E-01	2.000E-01	3.600E-01	0.
FREQUENCY	0.	6.000E+01	1.900E+03	4.000E+02	0.
RISETIME	0.	0.	0.	5.000E+01	0.
WUNSCH	3.800E+00	3.400E-02	8.500E-03	3.500E-02	4.400E-02
CURRENT	0.	5.000E-02	4.000E-02	2.000E-01	0.
GAIN	0.	8.000E+01	5.000E+01	0.	0.
DATA	M-01	M-12	M-12	M-12	M-01
REFERENCE	BASE	BASE	BASE	BASE	BASE
INPUT	EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
INVOLT	0.	6.000E+00	2.500E+00	4.000E+00	5.000E+00
INZ	0.	0.	0.	0.	0.
INZBLK5	0.	0.	0.	0.	0.
INZBLK50	0.	0.	0.	0.	0.
INCASETR	0.	0.	0.	0.	0.
INAMBTR	0.	0.	0.	0.	0.
INJUNCAP	0.	0.	0.	0.	3.000E+01
INMODELF					
INKF1	0.	0.	0.	0.	0.
INKF2	0.	0.	0.	0.	0.
INMODELR	WUNSCH	EXPO	EXPO	EXPO	WUNSCH
INKR1	3.800E+00	4.250E-01	2.450E-01	2.370E-02	4.400E-02
INKR2	0.	3.280E-01	2.670E-01	5.280E-01	0.
OUTPUT		COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR
OUTVOLT	0.	6.000E+01	3.000E+01	1.200E+01	6.000E+01
OUTZBLK5	0.	0.	0.	0.	0.
OUTZBLK50	0.	0.	0.	0.	0.
OUTCASETR	0.	0.	0.	1.460E+02	0.
OUTAMBTR	0.	5.000E+02	8.750E+02	4.860E+02	0.
OUTJUNCAP	0.	6.000E+00	1.000E+00	6.000E+00	8.000E+00
OUTMODELF					
OUTKF1	0.	0.	0.	0.	0.
OUTKF2	0.	0.	0.	0.	0.
OUTMODELR			WUNSCH		
OUTKR1	0.	0.	1.730E-02	0.	0.
OUTKR2	0.	0.	0.	0.	0.

Table 1 (Continued)

2N2907	2N2907A	2N2920	2N3251	2N329
MOTA	MOTA	FSC	RAYN	RAYN
BJTSP	BJTSP	BJTSN	BJTSP	BJTSP
PL.D		D	PL.D	F.A
TO18	TO18	CASE1	TO18	TO5
4.000E-01	0.	0.	3.600E-01	0.
2.000E+02	0.	0.	3.000E+02	0.
4.000E+01	0.	0.	3.500E+01	0.
1.400E-01	1.000E-01	4.000E-02	6.400E-02	2.200E-01
6.000E-01	0.	0.	2.000E-01	0.
0.	0.	0.	1.000E+02	0.
M-12	M-02	M-02	M-12	M-01
BASE	BASE	BASE	BASE	BASE
EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
5.000E+00	5.000E+00	6.000E+00	5.000E+00	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	3.000E+01	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
WUNSCH	WUNSCH	WUNSCH	EXPO	WUNSCH
1.400E-01	1.000E-01	4.000E-02	3.020E-04	2.200E-01
0.	0.	0.	8.550E-01	0.
COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR	
6.000E+01	6.000E+01	6.000E+01	5.000E+01	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
9.710E+01	0.	0.	1.450E+02	0.
4.390E+02	0.	0.	4.860E+02	0.
8.000E+00	8.000E+00	6.000E+00	6.000E+00	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
WUNSCH			EXPO	
4.450E-02	0.	0.	6.150E-04	0.
0.	0.	0.	8.810E-01	0.

Table 1 (Continued)

NUMBER	2N335	2N336	2N336A	2N338	2N343
VENDOR	TI	TI	ETC	IEC	TI
FUNCTION	BJTSN	BJTSN	BJTSN	BJTSN	BJTSN
STRUCTURE	G	G	D,G	PL,D	G
PACKAGE	T05	T05	T05	T05	T011
POWER	0.	0.	0.	1.250E-01	0.
FREQUENCY	0.	0.	0.	0.	0.
RISETIME	0.	0.	0.	6.000E+01	0.
WUNSCH	5.500E-01	5.500E-01	3.400E-01	4.600E-02	4.700E-02
CURRENT	0.	0.	0.	2.000E-02	0.
GAIN	0.	0.	0.	0.	0.
DATA	M-01	M-01	M-01	M-12	M-01
REFERENCE	BASE	BASE	BASE	BASE	BASE
INPUT	EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
INVOLT	1.000E+00	1.000E+00	4.000E+00	1.000E+00	1.000E+00
INZ	0.	0.	0.	0.	0.
INZRLKS	0.	0.	0.	0.	0.
INZRLK50	0.	0.	0.	0.	0.
INCASETR	0.	0.	0.	0.	0.
INAMBTR	0.	0.	0.	0.	0.
INJUNCAP	0.	0.	0.	0.	0.
INMODELF					
INKF1	0.	0.	0.	0.	0.
INKF2	0.	0.	0.	0.	0.
INMODELR	WUNSCH	WUNSCH	WUNSCH	EXPO	WUNSCH
INKR1	5.500E-01	5.500E-01	3.400E-01	7.640E+00	4.700E-02
INKR2	0.	0.	0.	1.400E-01	0.
OUTPUT	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR
OUTVOLT	4.500E+01	4.500E+01	4.500E+01	4.500E+01	6.000E+01
OUTZRLKS	0.	0.	0.	0.	0.
OUTZRLK50	0.	0.	0.	0.	0.
OUTCASETR	0.	0.	0.	0.	0.
OUTAMBTR	0.	0.	0.	1.000E+03	0.
OUTJUNCAP	7.000E+00	7.000E+00	7.000E+00	1.200E+00	0.
OUTMODELF					
OUTKF1	0.	0.	0.	0.	0.
OUTKF2	0.	0.	0.	0.	0.
OUTMODELR				EXPO	
OUTKR1	0.	0.	0.	1.160E+01	0.
OUTKR2	0.	0.	0.	2.800E-01	0.

Table 1 (Continued)

2N3585	2N375	2N389	2N4044	2N4393
MOTA	MOTA	TII	SODI	SOD
BJTSN	BJTGP	BJTSN	BJTSN	FETN
PL.D	Sw.	D		CH.
TO66	TO3	TO53	TO70	TO18
3.500E+01	0.	0.	7.500E+01	0.
1.000E+01	0.	0.	0.	0.
3.000E+03	0.	0.	0.	5.000E+00
3.430E+00	1.020E+00	2.140E+00	0.	1.500E+01
5.000E+00	0.	0.	0.	0.
0.	0.	0.	0.	0.
M-12	M-01	M-04	M-07	M-07
BASE	BASE	BASE	BASE	DRAIN
EMITTER	EMITTER	EMITTER	EMITTER	SOURCE
6.000E+00	4.000E+01	1.000E+01	3.000E-03	4.000E+01
0.	0.	0.	0.	1.000E+02
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	1.400E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
EXPO	WUNSCH	WUNSCH	EXPO	EXPO
9.820E-01	1.020E+00	2.140E+00	2.730E-03	1.240E-02
5.860E-01	0.	0.	3.230E-01	6.140E-01
COLLECTOR	COLLECTOR		COLLECTOR	GATE
5.000E+02	6.000E+01	0.	6.000E+01	4.000E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
5.000E+00	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	1.400E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
WUNSCH				
1.140E+00	0.	0.	0.	0.
0.	0.	0.	0.	0.

Table 1 (Continued)

NUMBER	2N463	2N491	2N495A	2N498	2N5117
VENDOR	KSC	GESY	CNS	III	SUDI
FUNCTION	BJTSP	DJTP	BJTSP	BJTSN	BJTSP
STRUCTURE	AL			D.PL	PL.
PACKAGE	TO32	TO13	TO1	TO5	TO78
POWER	0.	4.500E+01	0.	0.	7.500E+01
FREQUENCY	0.	0.	0.	0.	0.
RISETIME	0.	0.	0.	0.	0.
WUNSCH	5.700E+00	0.	5.500E-01	8.000E-01	0.
CURRENT	0.	0.	0.	0.	1.000E-02
GAIN	0.	0.	0.	0.	0.
DATA	M-04	M-07	M-01	M-01	M-07
REFERENCE	BASE	BASE	BASE	BASE	BASE
INPUT	EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
INVOLT	5.000E+01	0.	0.	8.000E+00	7.000E+00
INZ	0.	0.	0.	0.	0.
INZBLK5	0.	0.	0.	0.	0.
INZBLK50	0.	0.	0.	0.	0.
INCASETR	0.	0.	0.	0.	0.
INAMBTR	0.	0.	0.	0.	0.
INJUNCAP	0.	0.	0.	6.000E+01	0.
INMODELF					
INKF1	0.	0.	7.000E-01	0.	0.
INKF2	0.	0.	0.	0.	0.
INMODELR	WUNSCH	EXPO		WUNSCH	EXPO
INKR1	5.700E+00	4.470E+00	8.000E-01	8.000E-01	3.290E-03
INKR2	0.	5.330E-01	0.	0.	3.900E-01
OUTPUT		COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR
OUTVOLT	6.000E+01	0.	2.500E+01	1.000E+02	4.500E+01
OUTZBLK5	0.	0.	0.	0.	0.
OUTZBLK50	0.	0.	0.	0.	0.
OUTCASETR	0.	0.	0.	0.	0.
OUTAMBTR	0.	0.	0.	0.	0.
OUTJUNCAP	3.100E+02	0.	0.	1.300E+01	8.000E-01
OUTMODELF					
OUTKF1	0.	0.	0.	0.	0.
OUTKF2	0.	0.	0.	0.	0.
OUTMODELR					
OUTKR1	0.	0.	0.	0.	0.
OUTKR2	0.	0.	0.	0.	0.

Table 1 (Continued)

2N526	2N576A	2N618	2N656	2N657
GESY	ETC	MOTA	TII	TII
BJTGP	BJTGN	BJTGP	BJTSN	BJTSN
AL.	AL.	SW.	D.PL	D.PL
TO5	TO5	TO3	TO5	TO5
0.	0.	0.	0.	4.000E+00
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
3.900E-01	2.300E-02	8.800E-01	2.000E-01	6.200E-01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
M-01	M-01	M-01	M-04	M-01
BASE	BASE	BASE	BASE	BASE
EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
1.500E+01	1.500E+01	4.000E+01	8.000E+00	8.000E+00
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	4.380E+01
0.	0.	0.	0.	2.190E+02
0.	0.	0.	6.000E+01	6.000E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
3.900E-01	2.300E-02	8.800E-01	2.000E-01	6.200E-01
0.	0.	0.	0.	0.
COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR
4.500E+01	4.000E+01	8.000E+01	6.000E+01	1.000E+02
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
4.000E+01	1.500E+01	0.	1.300E+01	1.300E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.

Table 1 (Continued)

NUMBER	2N657A	2N685	2N687	2N697	2N699
VENDOR	GESY	GFSY	GFSY	MOTA	FSC
FUNCTION	BJTSN	SCR	SCR	BJTSN	BJTSN
STRUCTURE	ME.			D.ME	D.PL
PACKAGE	TO5	T018	T046	TO5	TO5
POWER	0.	0.	0.	6.000E-01	0.
FREQUENCY	0.	0.	0.	1.000E+02	0.
RISETIME	0.	0.	0.	0.	0.
WUNSCH	1.070E+00	1.400E+00	1.170E+01	1.140E+00	2.500E-01
CURRENT	0.	0.	0.	0.	0.
GAIN	0.	0.	0.	0.	0.
DATA	M-01	M-01	M-04	M-12	M-01
REFERENCE	BASE	BASE	BASE	BASE	BASE
INPUT	EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
INVOLT	1.000E+02	2.000E+02	3.000E+02	5.000E+00	5.000E+00
INZ	0.	0.	0.	0.	0.
INZBLK5	0.	0.	0.	0.	0.
INZBLK50	0.	0.	0.	0.	0.
INCASETR	0.	0.	0.	0.	0.
INAMBTR	0.	0.	0.	0.	0.
INJUNCAP	0.	0.	0.	0.	0.
INMODELF					
INKF1	0.	0.	0.	0.	0.
INKF2	0.	0.	0.	0.	0.
INMODELR	WUNSCH	WUNSCH	WUNSCH	EXPO	WUNSCH
INKR1	1.070E+00	1.400E+00	1.170E+01	4.340E+00	2.500E-01
INKR2	0.	0.	0.	2.460E-01	0.
OUTPUT				COLLECTOR	COLLECTOR
OUTVOLT	1.000E+02	0.	0.	6.000E+01	1.200E+02
OUTZBLK5	0.	0.	0.	0.	0.
OUTZBLK50	0.	0.	0.	0.	0.
OUTCASETR	0.	0.	0.	8.750E+01	0.
OUTAMBTR	0.	0.	0.	2.920E+02	0.
OUTJUNCAP	0.	0.	0.	2.000E+01	1.200E+01
OUTMODELF					
OUTKF1	0.	0.	0.	0.	0.
OUTKF2	0.	0.	0.	0.	0.
OUTMODELR				EXPO	
OUTKR1	0.	0.	0.	3.900E+01	0.
OUTKR2	0.	0.	0.	1.260E-01	0.

Table 1 (Continued)

2N706	2N708	2N736	2N760	2N834
TII	FSC	MOTA	NSC	RAYN
BJTSN	BJTSN	BJTSN	BJTSN	BJTSN
D.ME	PL.	PL.	ME.	PL.D
T018	T018	T018	T018	T018
0.	0.	0.	0.	3.000E-01
0.	0.	0.	0.	5.000E+08
0.	0.	0.	0.	0.
7.500E-03	3.000E-02	1.000E-01	3.400E-02	1.500E-02
0.	0.	0.	0.	2.000E-01
0.	0.	0.	0.	0.
M-04	M-04	M-01	M-01	M-08
BASE	BASE	BASE	BASE	BASE
EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
3.000E+00	5.000E+00	5.000E+00	8.000E+00	5.000E+00
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
				WUNSCH
0.	0.	0.	0.	5.000E-02
0.	0.	0.	0.	0.
WUNSCH	WUNSCH	WUNSCH	WUNSCH	EXPO
7.500E-03	3.000E-02	1.000E-01	3.400E-02	6.200E-02
0.	0.	0.	0.	4.000E-01
COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR
2.500E+01	4.000E+01	8.000E+01	6.000E+01	4.000E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	5.000E+02
5.000E+00	6.000E+00	1.000E+01	5.000E+00	2.800E+00
				WUNSCH
0.	0.	0.	0.	5.000E-02
0.	0.	0.	0.	0.
				WUNSCH
0.	0.	0.	0.	2.500E-02
0.	0.	0.	0.	0.

Table 1 (Continued)

NUMBER	2N858	2N659A	2N915	2N918	2N927
VENDOR	CRY	FSC	RAYN	CRY	CRY
FUNCTION	BJTSP	BJTSN	BJTSN	BJTSN	BJTSP
STRUCTURE		PL.D	PL.D	PL.D	AL.
PACKAGE	TO18	TO18	TO18	TO72	TO18
POWER	0.	3.600E-01	3.600E-01	2.000E-01	0.
FREQUENCY	0.	0.	3.000E+02	6.000E+02	0.
RISETIME	0.	0.	0.	0.	0.
WUNSCH	1.800E-01	1.700E-02	5.100E-02	8.600E-03	9.600E-02
CURRENT	0.	2.000E-01	0.	5.000E-02	0.
GAIN	0.	0.	5.000E+01	0.	0.
DATA	M-04	M-08	M-12	M-12	M-01
REFERENCE	BASE	BASE	BASE	BASE	BASE
INPUT	EMITTER	EMITTER	EMITTER	EMITTER	EMITTER
INVOLT	2.500E+01	5.000E+00	5.000E+00	3.000E+00	7.000E+01
INZ	0.	0.	0.	0.	0.
INZRLKS	0.	0.	0.	0.	0.
INZRLK50	0.	0.	0.	0.	0.
INCASETR	0.	0.	0.	0.	0.
INAMBTR	0.	0.	0.	0.	0.
INJUNCAP	0.	0.	0.	0.	0.
INMODELF		WUNSCH			
INKF1	0.	5.000E-02	0.	0.	0.
INKF2	0.	0.	0.	0.	0.
INMODELR	WUNSCH	EXPO	EXPO	EXPO	WUNSCH
INKR1	1.800E-01	3.100E-01	4.900E-02	2.090E+00	9.600E-02
INKR2	0.	3.000E-01	5.030E-01	7.920E-02	0.
OUTPUT	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR	COLLECTOR
OUTVOLT	4.000E+01	2.500E+01	4.500E+01	3.000E+01	7.000E+01
OUTZRLKS	0.	0.	0.	0.	0.
OUTZRLK50	0.	0.	0.	0.	0.
OUTCASETR	0.	1.460E+02	1.450E+02	5.840E+02	0.
OUTAMBTR	0.	5.000E+02	4.860E+02	8.750E+02	0.
OUTJUNCAP	5.000E+00	6.000E+00	6.000E+00	2.000E+00	2.000E+01
OUTMODELF		WUNSCH			
OUTKF1	0.	1.000E+00	0.	0.	0.
OUTKF2	0.	0.	0.	0.	0.
OUTMODELR		WUNSCH	WUNSCH		
OUTKR1	0.	2.000E-02	9.750E-02	0.	0.
OUTKR2	0.	0.	0.	0.	0.

Table 1 (Continued)

2N930	2N930	2N930A
FSC	FSC	SOD
BJTSN	BJTSN	BJTSN
PL.D	PL.D	
TO18	TO18	TO18
3.000E-01	3.000E-01	0.
3.000E+01	3.000E+01	0.
0.	0.	0.
4.600E-02	5.400E-02	2.000E-02
3.000E-02	3.000E-02	0.
1.500E+02	1.500E+02	0.
M-01	M-12	M-01
BASE	BASE	BASE
EMITTER	EMITTER	6.000E00
5.000E+00	5.000E+00	0.
0.	0.	0.
0.	0.	0.
0.	0.	0.
2.500E+02	0.	0.
5.000E+02	0.	0.
0.	0.	0.
0.	0.	0.
0.	0.	0.
WUNSCH	EXPO	WUNSCH
4.600E-02	8.300E-03	2.000E-02
0.	6.290E-01	0.
COLLECTOR	COLLECTOR	
4.500E+01	4.500E+01	6.000E+01
0.	0.	0.
0.	0.	0.
0.	1.700E+02	0.
0.	4.000E+02	0.
8.000E+00	8.000E+00	0.
0.	0.	0.
0.	0.	0.
	EXPO	
0.	3.820E-03	0.
0.	7.560E-01	0.

Table 2

SUPERSAP2 DIODE EXPERIMENTAL DATA

NUMBER	1NA351	LVA51A	LVA91A	1N1095	1N1124A
NUMBER					
VENDOR	CODI	TRW	TRW	TII	SYN
FUNCTION	DIODREF	DIODREF	DIODREF	DIODGP	DIODGP
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE		AL.	AL.		D
PACKAGE	D07	D014	D014	D03	D04
POWERA	6.000E-01	6.000E-01	6.000E-01	0.	0.
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	0.	0.	0.
CURRENT	0.	0.	0.	7.500E-01	3.300E+00
DATA	M-12	.GT.M-12	M-12	M-01	.GT.M-08
VOLT	4.250E+00	5.100E+00	9.100E+00	5.000E+02	2.500E+02
ZBLKS	0.	0.	0.	0.	0.
ZBLKS0	0.	0.	0.	0.	0.
CASETP	0.	0.	0.	0.	0.
ANRTR	0.	0.	0.	0.	0.
JUNCAP	0.	0.	0.	0.	0.
CAPVOLT	0.	0.	0.	0.	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	1.700E+01	1.280E+01	1.000E+01	8.800E-01	5.750E+00
MODELF	WUNSCH	WUNSCH	WUNSCH		WUNSCH
KF1	3.000E+01	1.400E+01	2.200E+01	0.	9.040E+00
KF2	0.	0.	0.	0.	0.
MODELR	WUNSCH	EXPO	WUNSCH	WUNSCH	EXPO
KR1	1.700E+01	1.090E+00	1.000E+01	8.800E-01	7.750E-05
KR2	0.	6.970E-01	0.	0.	1.220E+00

1N1126A	1N1202A	1N1206	1N1614	1N1615
SYN	UNK	SYN	UNK	SYN
DIODGP	DIODGP	DIODGP	DIODGP	DIODGP
SI	SI	SI	SI	SI
	D			
D04	D04	THREAD	D04	D04
0.	0.	1.800E+01	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
3.300E+00	1.200E+01	1.200E+01	5.000E+00	5.000E+00
.GT.M-08	.GT.M-08	.GT.M-08	.GT.M-08	.GT.M-08
5.000E+02	2.000E+02	6.000E+02	2.000E+02	4.000E+02
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	9.200E+00	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
1.510E+01	4.670E+00	1.590E+01	4.880E+00	1.280E+01
WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
1.330E+01	6.600E+00	2.250E+01	7.290E+00	1.330E+01
0.	0.	0.	0.	0.
WUNSCH	EXPO	WUNSCH	EXPO	WUNSCH
1.510E+01	1.210E+02	1.590E+01	2.600E+03	1.280E+01
0.	2.700E-01	0.	8.200E-02	0.

Table 2 (Continued)

NUMBER	1N1733A	1N2158	1N23RF	1N23WE	1N25
NUMBER					
VENDOR	IRW	SYN	ALP	ALP	ALP
FUNCTION	DIODGP	DIODGP	DIODMM	DIODMM	DIODMM
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE		D			
PACKAGE	A1	D05	MISC	MISC	MISC
POWERA	0.	0.	0.	0.	7.500E+02
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	0.	0.	0.
CURRENT	1.500E-01	2.500E+01	0.	0.	0.
DATA	M-04	.GT.M-04	M-04	M-04	M-04
VOLT	3.000E+03	4.000E+02	0.	0.	0.
ZBLKS	0.	0.	0.	0.	0.
ZBLK50	0.	0.	0.	0.	0.
CASETR	0.	0.	0.	0.	0.
AMBTR	0.	0.	0.	0.	0.
JUNCAP	0.	0.	0.	0.	0.
CAPVOLT	0.	0.	0.	0.	0.
ENERGY	0.	0.	0.	1.000E+00	0.
WUNSCH	1.130E+01	3.060E+01	9.400E-04	2.900E-04	2.600E-02
MODELF		WUNSCH			
KF1	0.	1.380E+01	0.	0.	0.
KF2	0.	0.	0.	0.	0.
MODELR	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
KR1	1.130E+01	3.060E+01	9.400E-04	2.900E-04	2.600E-02
KR2	0.	0.	0.	0.	0.

1N253	1N277	1N2929A	1N2970B	1N2984B
TEC	TEC	CRL	CRL	CRL
DIODGP	DIODGP	DIODTUN	DIODREF	DIODREF
SI	GE	GE	SI	SI
			D	
THRFAD	D07	T018	D04	D04
0.	8.000E-02	5.000E-03	0.	1.000E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
1.000E+00	0.	0.	0.	0.
M-01	M-04	M-01	.GT.M-08	.GT.M-08
9.500E+01	1.250E+02	0.	0.	2.000E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	9.000E+01	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
8.600E-01	2.700E-02	7.300E-02	2.340E+01	1.690E+01
			WUNSCH	WUNSCH
0.	0.	0.	1.180E+01	8.250E+00
0.	0.	0.	0.	0.
WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
8.600E-01	2.700E-02	7.300E-02	2.340E+01	1.690E+01
0.	0.	0.	0.	0.

Table 2 (Continued)

NUMBER	1N2985B	1N2985RB	1N2988A	1N2989B	1N2991B
VENDOR	CRL	MOTA	CRL	UNK	CRL
FUNCTION	DIODREF	DIODREF	DIODREF	DIODREF	DIODREF
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE	D	PL.D	D	D	D
PACKAGE	DO4	DO4	DO4	DO4	DO4
POWERA	1.000E+01	0.	1.000E+01	1.000E+01	1.000E+01
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	0.	0.	0.
CURRENT	0.	0.	0.	0.	0.
DATA	.GT.M-08	.GT.M-08	.GT.M-08	.GT.M-08	.GT.M-08
VOLT	2.200E+01	0.	2.700E+01	3.000E+01	3.600E+01
ZBLKS	0.	0.	0.	0.	0.
ZBLK50	0.	0.	0.	0.	0.
CASETR	0.	0.	0.	0.	0.
AMBTR	0.	0.	0.	0.	0.
JUNCAP	0.	0.	0.	0.	0.
CAPVOLT	0.	0.	0.	0.	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	1.670E+01	2.620E+01	2.770E+01	2.970E+01	3.570E+01
MODELF	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
KF1	4.990E+00	2.000E+01	9.790E+00	1.280E+01	1.000E+01
KF2	0.	0.	0.	0.	0.
MODELR	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
KR1	1.670E+01	2.620E+01	2.770E+01	2.970E+01	3.570E+01
KR2	0.	0.	0.	0.	0.

	1N3015B	1N3017B	1N3019B	1N3022B	1N3031B
	CRL	CRL	CRL	DIC	HAUF
	DIODREF	DIODREF	DIODREF	DIODREF	DIODREF
	SI	SI	SI	SI	SI
	D				
	DO4	AXIAL	AXIAL	AXIAL	AXIAL
	1.000E+01	1.000E+00	1.000E+00	1.000E+00	1.000E+00
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	.GT.M-08	.GT.M-08	.GT.M-08	.GT.M-08	.GT.M-08
	2.000E+02	7.500E+00	9.100E+00	1.200E+01	3.000E+01
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	8.790E+01	1.060E+01	2.680E+01	1.380E+01	2.840E+01
	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
	1.160E+01	6.640E+00	1.480E+01	9.960E+00	6.650E+00
	0.	0.	0.	0.	0.
	EXPO	WUNSCH	WUNSCH	WUNSCH	WUNSCH
	6.310E+03	1.060E+01	2.680E+01	1.380E+01	2.840E+01
	1.500E-01	0.	0.	0.	0.

Table 2 (Continued)

NUMBER	1N3035B	1N3037B	1N3040B	1N3064	1N3157
NUMBER					
VENDOR	CRL	CRL	CRL	UNK	DIC
FUNCTION	DIODREF	DIODREF	DIODREF	DIODSW	DIODREF
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE	D	D	D	PL.D	D
PACKAGE	AXIAL	AXIAL	AXIAL	DO7	DO7
POWERA	1.000E+00	1.000E+00	1.000E+00	0.	4.000E-01
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	0.	4.000E+00	0.
CURRENT	0.	0.	0.	0.	0.
DATA	.GT.M-08	.GT.M-08	.GT.M-08	M-08	M-08
VOLT	4.300E+01	5.100E+01	6.800E+01	7.500E+01	8.400E+00
ZBLKS	0.	0.	0.	0.	0.
ZBLK50	0.	0.	0.	0.	0.
CASETR	0.	0.	0.	0.	0.
AMBTR	0.	0.	0.	0.	0.
JUNCAP	0.	0.	0.	2.000E+00	0.
CAPVOLT	0.	0.	0.	7.500E+01	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	3.940E+01	5.170E+01	7.050E+01	1.700E-01	2.793E+01
MODELF	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
KF1	1.050E+01	7.390E+00	1.110E+01	1.590E-01	1.120E+02
KF2	0.	0.	0.	0.	0.
MODELR	EXPO	WUNSCH	WUNSCH	EXPO	EXPO
KR1	1.280E+03	5.170E+01	7.050E+01	6.000E-02	1.000E+00
KR2	2.600E-01	0.	0.	5.700E-01	7.600E-01

	1N3189	1N34A	1N3600	1N3600	1N3821A
	GESY		FSC	UNK	DIC
	DIODGP	DIODGP	DIODSW	DIODSW	DIODREF
	SI	GE	SI	SI	SI
	D	PC	PL.	PL.D	AL.
	AXIAL	A1	DO7	DO7	AXIAL
	0.	5.000E-02	0.	0.	1.000E+00
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	4.000E+00	4.000E+00	0.
	1.000E+00	0.	0.	0.	0.
	.GT.M-08	M-02	M-02	M-08	.GT.M-08
	2.000E+02	6.000E+01	7.500E+01	5.000E+01	3.300E+00
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	3.000E+02	0.	0.
	0.	0.	0.	2.500E+00	0.
	0.	0.	2.500E+00	5.000E+01	0.
	0.	0.	0.	0.	0.
W	7.430E+00	1.400E-02	1.800E-01	1.900E-01	1.200E+01
	WUNSCH			WUNSCH	WUNSCH
	1.080E+01	0.	0.	3.000E-01	3.900E+00
	0.	0.	0.	0.	0.
	WUNSCH	WUNSCH	WUNSCH	EXPO	WUNSCH
	7.430E+00	1.400E-02	1.800E-01	1.300E-03	1.200E+01
	0.	0.	0.	8.400E-01	0.

Table 2 (Continued)

NUMBER	1N3826A	1N4003	1N4006	1N4122	1N4148
NUMBER					
VENDOR	DIC	MOTA	MOTA	MOTA	FSC
FUNCTION	DIODREF	DIODGP	DIODGP	DIODREF	DIODSW
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE					
PACKAGE	AXIAL	D041	D041	D07	D035
POWERA	1.000E+00	0.	0.	2.500E-01	0.
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	0.	0.	4.000E+00
CURRENT	0.	1.000E+00	1.000E+00	0.	0.
DATA	.GT.M-0E	M-06	.GT.M-12	UN	M-12
VOLT	6.200E+00	2.000E+02	8.000E+02	3.600E+01	7.500E+01
ZPLKF	0.	0.	0.	0.	0.
ZPLK50	0.	0.	0.	0.	0.
CASETR	0.	0.	0.	0.	0.
AMBTP	0.	0.	0.	7.000E+02	0.
JUNCAP	0.	1.400E+01	0.	1.340E+02	0.
CAPVOLT	0.	0.	0.	0.	4.000E+00
ENERGY	0.	0.	0.	0.	0.
WUNSCH	1.960E+01	2.200E+00	5.310E-01	8.000E+00	1.130E-02
MODELF	WUNSCH		WUNSCH	WUNSCH	
KF1	7.180E+00	0.	1.800E+01	1.500E-01	0.
KF2	0.	0.	0.	0.	0.
MODELR	WUNSCH	WUNSCH	EXPO	WUNSCH	EXPO
KR1	9.600E+00	2.200E+00	2.040E-03	8.000E+00	5.540E-04
KR2	0.	0.	8.820E-01	0.	7.120E-01

1N429	1N4370	1N4385JAN	1N457	1N459
CRL	TEC	ITT	FSC	TII
DIODREF	DIODREF	DIODGP	DIODGP	DIODGP
SI	SI	SI	SI	SI
	A		D	PL
C1	D07	D029	A1	A1
2.000E-01	4.000E+01	0.	2.000E-01	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	1.000E+00	7.500E-02	0.
M-01	.GT.M-08	.GT.M-12	M-04	M-01
6.200E+00	2.400E+00	0.	7.000E+01	2.000E+02
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	3.750E+02	0.
0.	0.	0.	8.000E+00	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
6.000E-01	1.190E+01	2.980E-01	1.200E-01	5.900E-01
	WUNSCH	WUNSCH		
0.	2.500E-01	1.800E+01	0.	0.
0.	0.	0.	0.	0.
WUNSCH	EXPO	EXPO	WUNSCH	WUNSCH
6.000E-01	1.190E+00	4.630E-01	1.200E-01	5.900E-01
0.	6.700E-01	4.720E-01	0.	0.

Table 2 (Continued)

NUMBER	1N459A	1N482A	1N483B	1N484A	1N485
NUMBER					
VENDOR	TRW	TEC	TEC	TEC	TEC
FUNCTION	DIODGP	DIODGP	DIODGP	DIODGP	DIODGP
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE	D		D.ME		D.
PACKAGE	A1	DO7	AXIAL	DO7	DO7
POWERA	2.000E-01	2.500E-01	2.500E-01	2.500E-01	2.500E-01
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	0.	0.	0.
CURRENT	4.000E-02	1.000E-01	0.	1.000E-01	0.
DATA	M-01	M-01	M-08	M-04	M-08
VOLT	2.000E+02	3.600E+01	8.000E+01	1.300E+02	2.250E+02
ZBLKS	0.	0.	0.	0.	0.
ZBLK50	0.	0.	0.	0.	0.
CASETP	0.	0.	0.	0.	0.
AMBTR	0.	0.	0.	0.	0.
JUNCAP	4.000E+00	0.	0.	0.	0.
CAPVOLT	0.	0.	0.	0.	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	9.600E-01	9.600E-01	1.020E+00	4.500E-01	2.100E-01
MODELF			WUNSCH		WUNSCH
KF1	0.	0.	1.480E+00	0.	1.890E+00
KF2	0.	0.	0.	0.	0.
MODELR	WUNSCH	WUNSCH	EXPO	WUNSCH	EXPO
KR1	9.600E-01	9.600E-01	4.790E+00	4.500E-01	1.410E+01
KR2	0.	0.	4.000E-01	0.	1.900E-01

1N4937	1N5233	1N5253A	1N5287	1N5356
MOTA	MOTA	MOTA	MOTA	MOTA
DIODSW	DIODZEN	DIODREF	MISC	DIODZEN
SI	SI	SI	SI	SI
A1	DO7	DO7	DO7	A1
0.	5.000E-01	5.000E-01	6.000E-01	5.000E+00
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
2.000E+02	0.	0.	0.	0.
1.000E+00	0.	0.	0.	0.
M-02	M-06	M-07	M-07	M-06
6.000E+02	6.000E+00	2.500E+01	1.000E+02	3.600E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	2.500E+02	0.	0.	2.500E+01
6.580E+01	0.	3.500E+02	0.	0.
0.	4.400E+02	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
7.500E-01	8.000E+00	0.	0.	2.800E+01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
WUNSCH	WUNSCH	EXPO	EXPO	WUNSCH
7.500E-01	8.000E+00	2.160E+01	3.550E+00	2.800E+01
0.	0.	9.130E-01	5.950E-01	0.

Table 2 (Continued)

NUMBER	1N537	1N537A	1N538B	1N540	1N547
NUMBER					
VENDOR	TII	MOTA	GIC	TII	TII
FUNCTION	DIODGP	DIODZEN	DIODGP	DIODGP	DIODGP
MATERIAL	SI	ST	SI	SI	SI
STRUCTURE	D		D	D	
PACKAGE	DO3	A1	DO3	DO3	DO3
POWERA	0.	5.000E+00	0.	0.	0.
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	0.	0.	0.
CURRENT	7.500E-01	0.	7.500E-01	7.500E-01	7.500E-01
DATA	M-01	M-06	.GT.M-08	M-01	M-04
VOLT	1.000E+02	1.000E+02	0.	4.000E+02	6.000E+02
ZBLK5	0.	0.	0.	0.	0.
ZBLK50	0.	0.	0.	0.	0.
CASETR	0.	2.500E+01	0.	0.	0.
AMBTR	0.	0.	0.	0.	0.
JUNCAP	0.	0.	0.	0.	0.
CAPVOLT	0.	0.	0.	0.	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	5.100E-01	3.800E+01	8.530E+00	9.300E-01	1.210E+01
MODELF			WUNSCH		
KF1	0.	0.	1.780E+01	0.	0.
KF2	0.	0.	0.	0.	0.
MODELR	WUNSCH	WUNSCH	EXPO	WUNSCH	WUNSCH
KR1	5.100E-01	3.800E+01	2.340E+02	9.300E-01	1.210E+01
KR2	0.	0.	2.500E-01	0.	0.

1N5556	1N64	1N643A	1N645	1N645
GSE	APRX	TRW	TII	ITT
MISC	DIODGP	DIODSW	DIODGP	DIODGP
	GE	SI	SI	SI
	PC		D	D
DO13	DO7	A1	A1	AXIAL
0.	0.	0.	6.000E-01	6.000E-01
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	3.000E+02	0.	0.
0.	5.000E-02	0.	4.000E-01	4.000E-01
.GT.M-08	M-04	M-04	M-04	.GT.M-12
0.	2.500E+01	2.000E+02	2.250E+02	2.250E+02
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	2.040E+02	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
0.	0.	0.	0.	0.
4.130E+01	4.100E-02	1.000E-01	5.600E-01	7.130E-01
WUNSCH			WUNSCH	
8.770E+00	0.	0.	0.	2.700E+01
0.	0.	0.	0.	0.
WUNSCH	WUNSCH	WUNSCH	WUNSCH	EXPO
4.130E+01	4.100E-02	1.000E-01	5.600E-01	3.200E+00
0.	0.	0.	0.	3.960E-01

Table 2 (Continued)

NUMBER	1N646	1N647	1N658	1N661	1N702A
NUMBER					
VENDOR	TII	TII	FSC	TII	TII
FUNCTION	DIODGP	DIODGP	DIODSW	DIODSW	DIODZEN
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE	D	D	PL	D	D
PACKAGE	A1	A1	DO7	A1	A1
POWERA	6.000E-01	6.000E-01	0.	0.	2.500E-01
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	3.000E+02	3.000E+02	0.
CURRENT	4.000E-01	4.000E-01	2.000E-01	1.000E-01	0.
DATA	V-04	M-04	M-04	.GI.M-04	M-01
VOLT	3.000E+02	4.000E+02	1.200E+02	2.000E+02	2.600E+00
ZBLKS	0.	0.	0.	0.	0.
ZBLK50	0.	0.	0.	0.	0.
CASETP	0.	0.	0.	0.	0.
AMBTP	0.	0.	0.	0.	0.
JUNCAP	0.	0.	0.	2.700E+00	0.
CAPVOLT	0.	0.	0.	9.000E+00	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	2.290E+00	3.900E+00	9.200E-01	4.600E-01	1.000E+00
MODELF					
KF1	0.	0.	0.	0.	0.
KF2	0.	0.	0.	0.	0.
MODELR	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
KP1	2.290E+00	3.900E+00	9.200E-01	4.600E-01	1.000E+00
KP2	0.	0.	0.	0.	0.

	1N711A	1N746A	1N750A	1N751A	1N751A
	CRL	NPC	TII	TII	TII
	DIODZEN	DIODREF	DIODREF	DIODZEN	DIODZEN
	SI		SI	SI	SI
		PL.D	PL.D	D	D
	DO7	AXIAL	AXIAL	A1	A1
	2.500E-01	4.000E-01	4.000E-01	4.000E-01	4.000E-01
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	M-01	M-08	M-08	M-04	M-04
	7.500E+00	3.300E+00	4.700E+00	5.100E+00	5.100E+00
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	2.100E+00	1.600E+00	2.840E+00	6.300E+00	1.200E+00
		WUNSCH	WUNSCH		
	0.	3.000E+00	2.420E+00	0.	0.
	0.	0.	0.	0.	0.
	WUNSCH	EXPO	EXPO	WUNSCH	WUNSCH
	2.100E+00	3.470E+00	5.000E-02	6.300E+00	1.200E+00
	0.	4.400E-01	7.900E-01	0.	0.

Table 2 (Continued)

NUMBER	1N752A	1N753A	1N754A	1N755A	1N756
NUMBER					
VENDOR	TEC	TEC	NPC	TEC	TRW
FUNCTION	DIODREF	DIODREF	DIODREF	DIODREF	DIODREF
MATERIAL	SI	SI	SI	SI	SI
STRUCTURE	A	AL.	PL.D	AL.	AL.
PACKAGE	AXIAL	AXIAL	AXIAL	AXIAL	AXIAL
POWERA	4.000E-01	4.000E-01	4.000E-01	4.000E-01	4.000E-01
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	0.	0.	0.
CURRENT	0.	0.	0.	0.	0.
DATA	4-08	4-08	M-08	.6T.M-08	M-08
VOLT	5.600E+00	6.200E+00	6.800E+00	7.500E+00	8.200E+00
ZRLKS	0.	0.	0.	0.	0.
ZRLK50	0.	0.	0.	0.	0.
CASETR	0.	0.	0.	0.	0.
AMBTR	0.	0.	0.	0.	0.
JUNCAP	0.	0.	0.	0.	0.
CAPVOLT	0.	0.	0.	0.	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	1.059E+01	1.479E+01	1.120E+00	1.334E+01	2.042E+01
MODELF	WUNSCH	WUNSCH	WUNSCH	WUNSCH	WUNSCH
KF1	2.640E+01	2.210E+01	8.610E-01	2.890E+01	6.870E+01
KF2	0.	0.	0.	0.	0.
MODELR	EXPO	EXPO	EXPO	EXPO	EXPO
KR1	3.200E-01	4.300E-01	2.000E-02	3.000E-02	9.200E-01
KR2	7.700E-01	7.500E-01	7.900E-01	9.600E-01	7.400E-01

	1N757A	1N758A	1N763-2	1N816	1N82A
	TEC	TEC	DIC	TEC	NPC
	DIODREF	DIODREF	DIODZEN	DIODGP	DIODMM
	SI	SI	SI	SI	SI
	AL.	AL.			
	AXIAL	AXIAL	DO7	DO7	DO7
	4.000E-01	4.000E-01	2.500E-01	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	M-08	M-08	M-01	M-01	M-01
	9.100E+00	1.000E+01	7.000E+00	6.000E+00	5.000E+00
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	7.670E+00	6.170E+00	3.000E+00	1.500E+00	7.000E-04
	WUNSCH	WUNSCH			
	1.630E+01	2.450E+01	0.	0.	0.
	0.	0.	0.	0.	0.
	EXPO	EXPO	WUNSCH	WUNSCH	WUNSCH
	1.000E-01	2.630E-01	3.000E+00	1.500E+00	7.000E-04
	8.000E-01	7.300E-01	0.	0.	0.

Table 2 (Continued)

NUMBER	1N421	1N423	1N914	1N933J	1N963B
NUMBER					
VENDOR	TEC	TEC	TII	TEC	DIC
FUNCTION	DIODREF	DIODZEN	DIODSW	DIODGP	DIODREF
MATERIAL	SI	SI	SI	GE	SI
STRUCTURE	AL.	AL.	PL	PC	PL.D
PACKAGE	DO7	DO7	DO7	DO7	DO7
POWERA	2.500E-01	2.500E-01	0.	0.	4.000E-01
POWERC	0.	0.	0.	0.	0.
FREQUENCY	0.	0.	0.	0.	0.
RECTIME	0.	0.	4.000E+00	4.000E+02	0.
CURRENT	0.	0.	0.	0.	0.
DATA	.GT.M-08	M-01	M-04	M-01	.GT.M-08
VOLT	6.200E+00	6.200E+00	7.500E+01	1.000E+02	1.200E+01
ZBLKS	0.	0.	0.	0.	0.
ZBLK50	0.	0.	0.	0.	0.
CASETR	0.	0.	0.	0.	0.
AMBTR	0.	0.	0.	0.	0.
JUNCAP	0.	0.	4.000E+00	0.	0.
CAPVOLT	0.	0.	0.	0.	0.
ENERGY	0.	0.	0.	0.	0.
WUNSCH	1.910E+01	1.800E+00	9.600E-02	1.000E-01	6.170E+00
MODELF	WUNSCH				WUNSCH
KF1	4.940E+01	0.	0.	0.	1.220E+01
KF2	0.	0.	0.	0.	0.
MODELR	EXPO	WUNSCH	WUNSCH	WUNSCH	EXPO
KR1	2.950E-01	1.800E+00	9.600E-02	1.000E-01	1.200E-01
KR2	8.300E-01	0.	0.	0.	8.000E-01

	1N964B	1N965B	1N967	1N970B	1N972B
	FSC	DIC	MOTA	DIC	DIC
	DIODREF	DIODREF	DIODZEN	DIODREF	DIODREF
	SI	SI	SI	SI	SI
	PL.D	PL.D	PL.D	PL.D	PL.D
	DO7	DO7	DO7	DO7	DO7
	4.000E-01	4.000E-01	4.000E-01	4.000E-01	4.000E-01
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	M-08	.GT.M-08	M-01	.GT.M-08	.GT.M-08
	1.300E+01	1.500E+01	1.800E+01	2.400E+01	3.000E+01
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	3.130E+02	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.
	1.800E+00	7.590E+00	7.300E-01	6.460E+00	2.400E+01
	WUNSCH	WUNSCH		WUNSCH	WUNSCH
	2.250E+00	1.360E+01	0.	1.990E+01	4.400E+01
	0.	0.	0.	0.	0.
	EXPO	EXPO	WUNSCH	EXPO	EXPO
	1.000E-04	4.200E-02	7.300E-01	2.800E-01	7.590E-01
	1.170E+00	6.600E-01	0.	7.400E-01	7.200E-01

Table 2 (Continued)

NUMBER	1N973B	1N974B	1N981B
NUMBER			
VENDOR	MAUR	MOTA	MOTA
FUNCTION	DIODREF	DIODREF	DIODZEN
MATERIAL	SI	SI	SI
STRUCTURE	AL.	D	
PACKAGE	DO7	DO7	DO7
POWERA	4.000E-01	4.000E-01	4.000E-01
POWERC	0.	0.	0.
FREQUENCY	0.	0.	0.
RECTIME	0.	0.	0.
CURRENT	0.	0.	0.
DATA	.GT.M-0R	.GT.M-0R	M-01
VOLT	3.300E+01	3.600E+01	6.800E+01
ZELK5	0.	0.	0.
ZELK50	0.	0.	0.
CASETR	0.	0.	0.
AMBTR	0.	0.	0.
JUNCAP	0.	0.	0.
CAPVOLT	0.	0.	0.
ENERGY	0.	0.	0.
WUNSCH	4.270E+01	7.910E+00	1.400E+00
MODELF	WUNSCH	WUNSCH	
KF1	3.200E+01	5.540E+01	0.
KF2	0.	0.	0.
MODELR	EXPO	EXPO	WUNSCH
KR1	9.120E-12	2.570E-03	1.400E+00
KR2	2.760E+00	1.060E+00	0.

Table 3 HP9820 PROGRAM - TRANSISTOR, K VS. V_{BD}

```
0:
DSP "TR-K/V";
STP ⊢
1:
ENT "VI,VO,VM",R
26,"MODE",R28,"C
ODE",R25,"PLT",R
17;.1→R1;.001→R2
⊢
2:
IF R26=2;1→R1⊢
3:
4→R7;5→R8;R1↑
TN↑ R7→R3;R2↑
TN↑ R8→R4⊢
4:
ENT "START",R29,
"STOP",R22;1-
LOG R1→R6;ABS
INT LOG R4+1→R5⊢
5:
SCL 0,9.8,0,6.2;
PLT 1,1;PLT 1,5;
PLT 6,5;PLT 6,1;
PLT 1,1;PEN ⊢
6:
LTR .2,4.,122;
PLT "T-";FXD 0;
PLT R28;PLT "-";
PLT R25;PLT "=";
PLT R17⊢
7:
"P";LOG R4→R4;
LOG R2→R2;LOG R3
→R3;LOG R1→R1;5E
3→R7;0→R8⊢
8:
0→C;0→R18;0→R19;
0→R20;0→R21;0→A;
0→B;0→R30⊢
9:
"K";LDF R29,R31⊢
10:
IF R26=1;R34→Z⊢
11:
IF R26=2;R35→Z⊢
12:
IF R26=3;R36→Z⊢
13:
IF Z=0;GTO "S"⊢
14:
LOG Z→Y;LOG R33→
X⊢
15:
INT (R31/1E5)1E5
→R10;(INT (R31/1
E4)-INT (R10/1E4
))1E4→R12⊢
16:
(INT (R31/100)-
INT (R31/1E4)*10
0)100→R14;(R31/1
00-INT (R31/100)
)100→R16⊢
17:
JMP R28⊢
18:
IF R25=R10;GTO "
R"⊢
19:
IF R25=R12;GTO "
R"⊢
20:
IF R25=R14;GTO "
R"⊢
21:
IF R25=R16;GTO "
R"⊢
22:
IF R25=R10+R12;
GTO "R"⊢
23:
IF R25=R10+R14;
GTO "R"⊢
24:
IF R25=R10+R16;
GTO "R"⊢
25:
IF R25=R12+R14;
GTO "R"⊢
26:
IF R25=R12+R16;
GTO "R"⊢
27:
IF R25=R14+R16;
GTO "R"⊢
```

Table 3 (Continued)

```
28:
IF R25=R10+R12+R
14;GTO "R"⊢
29:
IF R25=R10+R12+R
16;GTO "R"⊢
30:
IF R25=R10+R14+R
16;GTO "R"⊢
31:
IF R25=R12+R14+R
16;GTO "R"⊢
32:
IF R25=R31;GTO "
R"⊢
33:
IF R25=0;GTO "R"
⊢
34:
"S";R29+1→R29;
IF R29<R22;GTO "
K"⊢
35:
C→R27;GTO "X"⊢
36:
"R";LTR R5-X+.03
,Y+R6-.05,122;
IF R7>Y;Y→R7⊢
37:
IF Y>R8;Y→R8⊢
38:
JMP R17⊢
39:
PLT R10/1E5;GTO
"V"⊢
40:
PLT R12/1E4;GTO
"V"⊢
41:
R14/100→Z;JMP 3⊢
42:
R16→Z;JMP 2⊢
43:
PLT "0";GTO "V"⊢
44:
IF Z<9;PLT Z;
GTO "V"⊢
45:
IF Z>9;Z-9→Z;
JMP Z⊢
46:
PLT "A";JMP 9⊢
47:
PLT "C";JMP 8⊢
48:
PLT "D";JMP 7⊢
49:
PLT "E";JMP 6⊢
50:
PLT "F";JMP 5⊢
51:
PLT "H";JMP 4⊢
52:
PLT "J";JMP 3⊢
53:
PLT "K";JMP 2⊢
54:
PLT "L";JMP 1⊢
55:
"V";IF C<39;C*2→
Z;X→R(40+Z);Y→R(
41+Z)⊢
56:
Y+R18→R18;X+R19→
R19;Y*Y+R20→R20;
Y*X+R21→R21;X*X+
R30→R30⊢
57:
1+C→C;IF C=35;0→
A;.35→B⊢
58:
.15+A→A;LTR .9+A
,5.05+B,122;FXD
0;PLT R29;GTO "S
"⊢
59:
"X";0→C⊢
60:
R27*R20-R18*R18→
A;(R19*R20-R18*R
21)/A→R23⊢
61:
(R27*R21-R18*R19
)/A→R24;.2COS
ATN ABS R24→Y⊢
62:
(R20-R18*R18/R27
)/(R27-1)→R25;(R
30-R19*R19/R27)/
(R27-1)→R17⊢
```

Table 3 (Continued)

```
63:
(R27-1)(R17-R24*
R24*R25)/(R27-2)
→R11;1+1/R27→R15
;R18/R27→R9⊢
64:
0→R39;IF R27>40;
GTO "T"⊢
65:
R23→R24*R(41+C)→
A;R(40+C)→B;A-B→
Z;IF ABS Z>R39;
ABS Z→R39⊢
66:
C+2→C;IF R27>C/2
;GTO -1⊢
67:
0→C⊢
68:
"T";1+C→C;R1→A;
IF C=1;1→X;JMP 5
⊢
69:
IF C=2;2→X;rR11→
R11;JMP 5⊢
70:
IF C=3;R11*-1→R1
1;JMP 4⊢
71:
IF C=4;GTO "D"⊢
72:
"E";JMP X⊢
73:
A→Y→A;R23+R24*A→
B;JMP 2⊢
74:
A+2Y→A;R23+R24*A
+1*R11→B⊢
75:
IF A>R3;GTO "T"⊢
76:
IF B≤R2;GTO "E"⊢
77:
IF B>R4;GTO "E"⊢
78:
PLT R5-B,A+R6;
PEN ;GTO "E"⊢
79:
"D";LTR 7.35,4.4
,122;PLT "A, ";
FXD 3;PLT R23⊢
80:
LTR 7.5,4.4,122;
PLT "B, ";PLT R2
4⊢
81:
R24rR(R25/R17)→R2
6;LTR 7.65,4.4,1
22;PLT "R, ";
FXD 4;PLT R26⊢
82:
LTR 7.8,4.4,122;
PLT "S, ";FXD 1;
PLT 20ABS R11;
PLT " DB"⊢
83:
LTR 7.95,4.4,122
;PLT "D, ";PLT 2
0*R39;PLT " DB"⊢
84:
LTR 8.1,4.4,122;
FXD 0;PLT "N, ";
PLT R27⊢
85:
LTR 8.25,4.4,122
;FXD 1;PLT "VL,
 ";PLT TN↑ R7;
PLT " V"⊢
86:
LTR 8.4,4.4,122;
PLT "VH, ";PLT
TN↑ R8;PLT " V"⊢
87:
END ⊢
R1137
```

Table 4 HP9820 PROGRAM - TRANSISTOR, LEGEND

```
0:
DSP "TR - LEG";
STP ⊢
1:
ENT "VI,VO,VH",R
7,"MODE",R2,"COD
E",R1,.1→R5;.001
→R6;IF R7=2;1→R5
⊢
2:
ENT "PLT",R3⊢
3:
R5*TN↑ 4→R8;R6*
TN↑ 5→R4;SCL 0,9
.8,0,6.2⊢
4:
LTR .35,4,122;
FXD 0;PLT "T-";
PLT R2;PLT "-";
PLT R1;PLT "-";
PLT R3⊢
5:
1.05→X;.3→Y;1→C;
R4→A;FXD 0⊢
6:
LTR X,Y,122;PLT
R4⊢
7:
"M";A/10→A;1+X→X
;1+C→C;IF C>6;
GTO "L"⊢
8:
IF 1>A;FXD 4⊢
9:
LTR X,Y,122;PLT
A;GTO "M"⊢
10:
"L";LTR 4.1,,15,
2.3;PLT "K (MEAS
URED)"⊢
11:
6.2→X;.9→Y;1→C;R
5→A;FXD 0;IF 1>R
5;FXD 4⊢
12:
LTR X,Y,122;PLT
R5⊢
13:
"0";A*10→A;1+Y→Y
;1+C→C;FXD 0;IF
C>5;GTO "N"⊢
14:
.03*C→B;IF 1>A;
FXD 4⊢
15:
LTR X,Y,122;PLT
A;GTO "0"⊢
16:
"N";6.4→X;2.3→Y;
LTR X,Y,122;PLT
"VBD ";JMP R7⊢
17:
PLT "(INVOLT)";
JMP 3⊢
18:
PLT "(OUTVOLT)";
JMP 2⊢
19:
PLT "(MEAS)"⊢
20:
1→X;2→Y;0→C⊢
21:
LTR X,Y,104;PLT
"1";1+Y→Y;1+C→C;
IF C≤2;GTO -0⊢
22:
0→C;1+X→X⊢
23:
LTR X,Y,203;PLT
"1";1+C→C;1+X→X;
IF C≤3;GTO -0⊢
24:
0→C;6→X;4→Y⊢
25:
LTR X,Y,102;PLT
"1";1+C→C;Y-1→Y;
IF C≤2;GTO -0⊢
26:
0→C;1→Y;5→X⊢
27:
LTR X,Y,201;PLT
"1";1+C→C;X-1→X;
IF C≤3;GTO -0⊢
28:
LTR 6.7,2.3,122;
FXD 0;PLT "-TRAN
SISTORS-"⊢
29:
LTR 6.9,.8,122⊢
30:
INT (R1/1E5)→R2;
INT (R1/1E4)-R2*
```

Table 4 (Continued)

```
10→R4⊢
31:
INT (R1/100)-100
INT (R1/1E4)→R8:
(R1/100-INT (R1/
100))*100→R6⊢
32:
R2→A:PLT "("⊢
33:
IF A=0:PLT "
    "⊢
34:
IF A=1:PLT " SIL
ICON "⊢
35:
IF A=2:PLT "GERM
ANIUM"⊢
36:
IF A=3:PLT "  F
ET   "⊢
37:
R4→A:PLT ")-("⊢
38:
IF A=0:PLT "
"⊢
39:
IF A=1:PLT "NPN
"⊢
40:
IF A=2:PLT "PNP
"⊢
41:
IF A=3:PLT "N-CH
"⊢
42:
IF A=4:PLT "P-CH
"⊢
43:
IF A=5:PLT "SCR
"⊢
44:
R8→A:PLT ")-("⊢
45:
IF A=0:PLT "
    "⊢
46:
IF A=1:PLT " CHO
PPER  "⊢
47:
IF A=2:PLT "  SW
ITCH  "⊢
48:
IF A=3:PLT "  M
ESA   "⊢
49:
IF A=4:PLT "UNDE
FINED "⊢
50:
IF A=5:PLT "  AL
LOY   "⊢
51:
IF A=6:PLT "FUSE
D AL. "⊢
52:
IF A=7:PLT "AL.
PLAN. "⊢
53:
IF A=8:PLT " DIF
FUSED "⊢
54:
IF A=9:PLT "  PL
ANAR  "⊢
55:
IF A=10:PLT "DIF
F. MESA"⊢
56:
IF A=11:PLT "PLA
N. EP."⊢
57:
IF A=12:PLT "
 N8    "⊢
58:
IF A=13:PLT "DIF
F. GR."⊢
59:
IF A=14:PLT "  F
USED   "⊢
60:
IF A=15:PLT "PLA
N.DIFF."⊢
61:
IF A=16:PLT "  G
ROWN   "⊢
62:
IF A=17:PLT "DIF
F.PLAN."⊢
63:
R6→A:PLT ")-("⊢
64:
IF A=0:PLT "
   "⊢
```

Table 4 (Continued)

```
65:
"E";IF A=1;PLT "
 TO3  "⊢
66:
IF A=2;PLT " TO5
  "⊢
67:
IF A=3;PLT " TO1
8 "⊢
68:
IF A=4;PLT " TO3
6 "⊢
69:
IF A=5;PLT " TO3
9 "⊢
70:
IF A=6;PLT " TO6
4 "⊢
71:
IF A=7;PLT " TO7
8 "⊢
72:
IF A=8;PLT "THRE
AD"⊢
73:
IF A=9;PLT " TO4
8 "⊢
74:
IF A=10;PLT " TO
72 "⊢
75:
IF A=11;PLT " TO
8  "⊢
76:
IF A=12;PLT " TO
66 "⊢
77:
IF A=13;PLT " TO
11 "⊢
78:
IF A=14;PLT " TO
70 "⊢
79:
IF A=15;PLT " TO
53 "⊢
80:
IF A=16;PLT "CAS
E 1"⊢
81:
IF A=17;PLT " TO
32 "⊢
```

```
82:
IF A=18;PLT " TO
1  "⊢
83:
PLT ")"⊢
84:
0→X;0→Y;0→C⊢
85:
"K";LTR 7.2,4.6,
122;PLT "-DATA-"
⊢
86:
LTR 7.2,1.1,122;
PLT "-LEGEND-"⊢
87:
IF R3=1;PLT "(MA
TERIAL)-"⊢
88:
IF R3=2;PLT "(FU
NCTION)-"⊢
89:
IF R3=3;PLT "(ST
RUCTURE)-"⊢
90:
IF R3=4;PLT "(PA
CKAGE)-"⊢
91:
0→A;.15→X;.8→B;
IF R3=5;STP ⊢
92:
IF R3=1;GTO "G"⊢
93:
IF R3=2;GTO "H"⊢
94:
IF R3=3;GTO "I"⊢
95:
IF R3=4;GTO "J"⊢
96:
"G";LTR 7.2+X,B,
122;X+.15→X;A+1→
A;JMP A⊢
97:
PLT "1, SILICON"
;GTO "G"⊢
98:
PLT "2, GERMANIU
M";GTO "G"⊢
99:
PLT "3, FET";
STP ⊢
```

Table 4 (Continued)

```
100:
"H";LTR 7.2+X,B,.
122;X+.15→X;A+1→
A;JMP A⊢
101:
PLT "1, NPN";
GTO "H"⊢
102:
PLT "2, PNP";
GTO "H"⊢
103:
PLT "3, N-CH";
GTO "H"⊢
104:
PLT "4, P-CH";
GTO "H"⊢
105:
PLT "5, SCR";
STP ⊢
106:
"I";LTR 7.2+X,B,
122;X+.15→X;A+1→
A;JMP A⊢
107:
PLT "1, CHOPPER"
;GTO "I"⊢
108:
PLT "2, SWITCH";
GTO "I"⊢
109:
PLT "3, MESA";
GTO "I"⊢
110:
PLT "4, UNDEFINE
D";GTO "I"⊢
111:
PLT "5, ALLOY";
GTO "I"⊢
112:
PLT "6, FUSED AL
LOY";GTO "I"⊢
113:
PLT "7, AL.PLAN"
;GTO "I"⊢
114:
PLT "8, DIFFUSED
";GTO "I"⊢
115:
PLT "9, PLANAR";
2.6→B;.15→X;GTO
"I"⊢
116:
PLT "A, DIFF.MES
A";GTO "I"⊢
117:
PLT "C, PLAN. EP
.";GTO "I"⊢
118:
PLT "D, N8";GTO
"I"⊢
119:
PLT "E, DIFF. GR
.";GTO "I"⊢
120:
PLT "F, FUSED";
GTO "I"⊢
121:
PLT "H, PLAN. DI
FF.";GTO "I"⊢
122:
PLT "J, GROWN";
GTO "I"⊢
123:
PLT "K, DIFF. PL
AN.";STP ⊢
124:
"J";LTR 7.2+X,B,
122;X+.15→X;A+1→
A;JMP A⊢
125:
PLT "1, TO3";
GTO "J"⊢
126:
PLT "2, TO5";
GTO "J"⊢
127:
PLT "3, TO18";
GTO "J"⊢
128:
PLT "4, TO36";
GTO "J"⊢
129:
PLT "5, TO39";
GTO "J"⊢
130:
PLT "6, TO64";
GTO "J"⊢
131:
PLT "7, TO78";
GTO "J"⊢
```

Table 4 (Continued)

```
132:
PLT "8, THREAD";
GTO "J"⊦
133:
PLT "9, T048";2.
6→B;.15→X;GTO "J
"⊦
134:
2.6→B;PLT "A, TO
72";GTO "J"⊦
135:
PLT "C, T08";
GTO "J"⊦
136:
PLT "D, T066";
GTO "J"⊦
137:
PLT "E, T011";
GTO "J"⊦
138:
PLT "F, T070";
GTO "J"⊦
139:
PLT "H, T053";
GTO "J"⊦
140:
PLT "J, CASE 1";
GTO "J"⊦
141:
PLT "K, T032";
GTO "J"⊦
142:
PLT "L, T01";
STP ⊦
143:
END ⊦
R1036
```

Table 5 HP9820 PROGRAM - DIODE, K VS. V_{BD}

```
0:
DSP "DI-K/V";
STP ⊢
1:
ENT "VI,VM",R26,
"MODE",R28,"CODE
",R25,"PLT",R17;
1→R1;.01→R2⊢
2:
4→R7;5→R8;R1*
TN↑ R7→R3;R2*
TN↑ R8→R4⊢
3:
ENT "START",R29,
"STOP",R22;1-
LOG R1→R6;ABS
INT LOG R4+1→R5⊢
4:
SCL 0,9.8,0,6.2;
PLT 1,1;PLT 1,5;
PLT 6,5;PLT 6,1;
PLT 1,1;PEN ⊢
5:
LTR .2,4,122;
PLT "D-";FXD 0;
PLT R28;PLT "-";
PLT R25;PLT "-";
PLT R17⊢
6:
"P";LOG R4→R4;
LOG R2→R2;LOG R3
→R3;LOG R1→R1;5E
-3→R7;0→R8⊢
7:
0→C;0→R18;0→R19;
0→R20;0→R21;0→A;
0→B;0→R30⊢
8:
"K";LDF R29,R31⊢
9:
IF R26=1;R34→Z⊢
10:
IF R26=2;R36→Z⊢
11:
IF Z=0;GTO "S"⊢
12:
IF R33>1000;GTO
"S"⊢
13:
LOG Z→Y;LOG R33→
X⊢
14:
INT (R31/1E4)1E4
→R10;(INT (R31/1
E3)-R10/1E3)1E3→
R12⊢
15:
INT (R31/100)100
-(R10+R12)→R14;R
31-INT (R31/100)
100→R16⊢
16:
JMP R28⊢
17:
IF R25=R10;GTO "
R"⊢
18:
IF R25=R12;GTO "
R"⊢
19:
IF R25=R14;GTO "
R"⊢
20:
IF R25=R16;GTO "
R"⊢
21:
IF R25=R10+R12;
GTO "R"⊢
22:
IF R25=R10+R14;
GTO "R"⊢
23:
IF R25=R10+R16;
GTO "R"⊢
24:
IF R25=R12+R14;
GTO "R"⊢
25:
IF R25=R12+R16;
GTO "R"⊢
26:
IF R25=R14+R16;
GTO "R"⊢
27:
IF R25=R10+R12+R
14;GTO "R"⊢
28:
IF R25=R10+R12+R
16;GTO "R"⊢
29:
IF R25=R10+R14+R
16;GTO "R"⊢
```

Table 5 (Continued)

```
30:
IF R25=R12+R14+R
16;GTO "R"⊢
31:
IF R25=R31;GTO "
R"⊢
32:
IF R25=0;GTO "R"
⊢
33:
"S";R29+1→R29;
IF R29≤R22;GTO "
K"⊢
34:
.C→R27;GTO "X"⊢
35:
"R";LTR R5-X+.03
,Y+R6-.05,122⊢
36:
IF R7>Y;Y→R7⊢
37:
IF Y>R8;Y→R8⊢
38:
JMP R17⊢
39:
PLT R10/1E4;GTO
"V"⊢
40:
PLT R12/1E3;GTO
"V"⊢
41:
R14/100→Z;JMP 3⊢
42:
R16→Z;JMP 2⊢
43:
PLT "0";GTO "V"⊢
44:
IF Z≤9;PLT Z;
GTO "V"⊢
45:
IF Z>9;Z-9→Z;
JMP 2⊢
46:
PLT "A";GTO "V"⊢
47:
PLT "C";GTO "V"⊢
48:
PLT "D";GTO "V"⊢
49:
PLT "E";GTO "V"⊢
50:
PLT "F";GTO "V"⊢
51:
PLT "H";GTO "V"⊢
52:
"V";IF C≤39;C+2→
Z;X→R(40+Z);Y→R(
41+Z)⊢
53:
Y+R18→R18;X+R19→
R19;Y*Y+R20→R20;
Y*X+R21→R21;X*X+
R30→R30⊢
54:
1+C→C;IF C=35;0→
A;.35→B⊢
55:
IF C=69;0→A;.7→B
⊢
56:
.15+A→A;LTR .9+A
,5.05+B,122;FXD
0;PLT R29;GTO "S
"⊢
57:
"X";0→C;R27*R20-
R18*R18→A;(R19*R
20-R18*R21)/A→R2
3⊢
58:
(R27*R21-R18*R19
)/A→R24;.2COS
ATN ABS R24→Y⊢
59:
(R20-R18*R18/R27
)/(R27-1)→R25;(R
30-R19*R19/R27)/
(R27-1)→R17⊢
60:
(R27-1)(R17-R24*
R24*R25)/(R27-2)
→R11!1+1/R27→R15
;R18/R27→R9⊢
61:
0→R39;IF R27>40;
GTO "T"⊢
62:
R23+R24*R(41+C)→
A;R(40+C)→B;A-B→
Z;IF ABS Z>R39;
ABS Z→R39⊢
```

Table 5 (Continued)

```
63:
C+2→C;IF R27>C/2
;GTO -1⊢
64:
0→C⊢
65:
"T";1+C→C;R1→A;
IF C=1;1→X;JMP 5
⊢
66:
IF C=2;2→X;rR11→
R11;JMP 5⊢
67:
IF C=3;R11*-1→R1
1;JMP 4⊢
68:
IF C=4;GTO "D"⊢
69:
"E";JMP X⊢
70:
A+Y→A;R23+R24*A→
B;JMP 2⊢
71:
A+2Y→A;R23+R24*A
+R11→B⊢
72:
IF A>R3;GTO "T"⊢
73:
IF B<R2;GTO "E"⊢
74:
IF B>R4;GTO "E"⊢
75:
PLT R5-B,A+R6;
PEN ;GTO "E"⊢
76:
"D";LTR 7.35,4.4
,122;PLT "A, ";
FXD 3;PLT R23⊢
77:
LTR 7.5,4.4,122;
PLT "B, ";PLT R2
4⊢
78:
R24rR25/R17→R2
6;LTR 7.65,4.4,1
22;PLT "R, ";
FXD 4;PLT R26⊢
79:
LTR 7.8,4.4,122;
PLT "S, ";FXD 1;
PLT 2ΛABS R11;
PLT " DB"⊢
80:
LTR 7.95,4.4,122
;PLT "D, ";PLT 2
0+ABS R39;PLT "
DB"⊢
81:
LTR 8.1,4.4,122;
FXD 0;PLT "N, ";
PLT R27⊢
82:
LTR 8.25,4.4,122
;FXD 1;PLT "VL,
";PLT TN↑ R7;
PLT " V"⊢
83:
LTR 8.4,4.4,122;
PLT "VH, ";PLT
TN↑ R8;PLT " V"⊢
84:
END ⊢
R1139
```

Table 6 HP9820 PROGRAM - DIODE, LEGEND

```
0:
DSP "DI - LEG";
STP ⊢
1:
ENT "V1",VM",R7,"
MODE",R2,"CODE",
R1;1→R5; 01→R6⊢
2:
ENT "PLT",R3⊢
3:
R5↑INT 4→R8;R6↑
TH↑ 5→R4;SCL 0,9
.8,0,6.2⊢
4:
LTR .35,4,122;
FXD 0;PLT "D-";
PLT R2;PLT "-";
PLT R1;PLT "-";
PLT R3⊢
5:
1.05→X;.3→Y;1→C;
R4→A;FXD 0⊢
6:
LTR X,Y,122;PLT
R4⊢
7:
"M";A/10→A;1+X→X
;1+C→C;IF C>6;
GTO "L"⊢
8:
IF 1>A;FXD 4⊢
9:
LTR X,Y,122;PLT
A;GTO "M"⊢
10:
"L";LTR 4.1,.15,
213;PLT "K (MEAS
URED)"⊢
11:
6.2→X;.9→Y;1→C;R
5→A;FXD 0;IF 1>R
5;FXD 4⊢
12:
LTR X,Y,122;PLT
R5⊢
13:
"0";A*10→A;1+Y→Y
;1+C→C;FXD 0;IF
C>5;GTO "N"⊢
14:
.03*C→B;IF 1>A;
FXD 4⊢
15:
LTR X,Y,122;PLT
A;GTO "0"⊢
16:
"N";6.4→X;2.5→Y;
LTR X,Y,122;PLT
"VBD ";JMP R7⊢
17:
PLT "(VOLT)";
JMP 3⊢
18:
PLT "(MEAS)";
JMP 2⊢
19:
PLT "(MEAS)"⊢
20:
1→X;2→Y;0→C⊢
21:
LTR X,Y,104;PLT
"I";1+Y→Y;1+C→C;
IF C≤2;GTO -0⊢
22:
0→C;1+X→X⊢
23:
LTR X,Y,203;PLT
"I";1+C→C;1+X→X;
IF C≤3;GTO -0⊢
24:
0→C;6→X;4→Y⊢
25:
LTR X,Y,102;PLT
"I";1+C→C;Y-1→Y;
IF C≤2;GTO -0⊢
26:
0→C;1→Y;5→X⊢
27:
LTR X,Y,201;PLT
"I";1+C→C;X-1→X;
IF C≤3;GTO -0⊢
28:
LTR 6.7,2.8,122;
FXD 0;PLT "-DIOD
ES-"⊢
29:
LTR 6.9,.6,122⊢
30:
INT (R1/1E4)→R2;
INT (R1/1E3)-R2*
10→R4⊢
```

Table 6 (Continued)

```
31:
INT (R1/100)-10
INT (R1/1E3)→R8;
:R1/100-INT (R1/
100))100→R6⊢
32:
R2→A;PLT "("⊢
33:
IF A=0;PLT "
     "⊢
34:
IF A=1;PLT " SIL
ICON "⊢
35:
IF A=2;PLT "GERM
ANIUM"⊢
36:
IF A=3;PLT "UNDE
FINED"⊢
37:
R4→A;PLT ")-("⊢
38:
IF A=0;PLT "
"⊢
39:
IF A=1;PLT "GEN.
 PURP."⊢
40:
IF A=2;PLT "REFE
RENCE"⊢
41:
IF A=3;PLT "SWIT
CH"⊢
42:
IF A=4;PLT "ZENE
R"⊢
43:
IF A=5;PLT "MICR
O MIXER"⊢
44:
R8→A;PLT ")-("⊢
45:
IF A=0;PLT "
     "⊢
46:
IF A=1;PLT "UNDE
FINED"⊢
47:
IF A=2;PLT "PLAN
AR"⊢
48:
IF A=3;PLT "DIFF
USED"⊢
49:
IF A=4;PLT "PLAN
. DIFF."⊢
50:
IF A=5;PLT "PT.
CONT."⊢
51:
IF A=6;PLT " ALL
OY "⊢
52:
IF A=7;PLT "DIFF
. MESA"⊢
53:
R6→A;PLT ")-("⊢
54:
IF A=0;PLT "
  "⊢
55:
"E";IF A=1;PLT "
 D03  "⊢
56:
IF A=2;PLT " D04
  "⊢
57:
IF A=3;PLT " D05
  "⊢
58:
IF A=4;PLT " D07
  "⊢
59:
IF A=5;PLT " D01
3 "⊢
60:
IF A=6;PLT " D01
4 "⊢
61:
IF A=7;PLT " D02
9 "⊢
62:
IF A=8;PLT " D03
5 "⊢
63:
IF A=9;PLT " D04
1 "⊢
64:
IF A=10;PLT "AXI
AL "⊢
```

Table 6 (Continue')

```
65:
IF A=11;PLT "
A1  "⊢
66:
IF A=12;PLT " TO
18 "⊢
67:
IF A=13;PLT "THR
EAD"⊢
68:
IF A=14;PLT " MI
SC "⊢
69:
IF A=15;PLT "CAS
E 1"⊢
70:
PLT ")"⊢
71:
0→X;0→Y;0→C⊢
72:
"K";LTR 7.2,4.6,
122;PLT "-DATA-"
⊢
73:
LTR 7.2,1.1,122;
PLT "-LEGEND-"⊢
74:
IF R3=1;PLT "(MA
TERIAL)-"⊢
75:
IF R3=2;PLT "(FU
NCTION)-"⊢
76:
IF R3=3;PLT "(ST
RUCTURE)-"⊢
77:
IF R3=4;PLT "(PA
CKAGE)-"⊢
78:
0→A;.15→X;.8→B;
IF R3=5;STP ⊢
79:
IF R3=1;GTO "G"⊢
80:
IF R3=2;GTO "H"⊢
81:
IF R3=3;GTO "I"⊢
82:
IF R3=4;GTO "J"⊢
83:
"G";LTR 7.2+X,B,
122;X+.15→X;A+1→
A;JMP A⊢
84:
PLT "1, SILICON"
;GTO "G"⊢
85:
PLT "2, GERMANIU
M";GTO "G"⊢
86:
PLT "3, UNDEFINE
D";STP ⊢
87:
"H";LTR 7.2+X,B,
122;X+.15→X;A+1→
A;JMP A⊢
88:
PLT "1, GENERAL
PURPOSE";GTO "H"
⊢
89:
PLT "2, REFERENC
E";GTO "H"⊢
90:
PLT "3, SWITCH";
GTO "H"⊢
91:
PLT "4, ZENER";
GTO "H"⊢
92:
PLT "5, MICRO MI
XER";STP ⊢
93:
"I";LTR 7.2+X,B,
122;X+.15→X;A+1→
A;JMP A⊢
94:
PLT "1, UNDEFINE
D";GTO "I"⊢
95:
PLT "2, PLANAR";
GTO "I"⊢
96:
PLT "3, DIFFUSED
";GTO "I"⊢
97:
PLT "4, PLANAR D
IFFUSED";GTO "I"
⊢
98:
PLT "5, POINT CO
NTACT";GTO "I"⊢
```

Table 6 (Continued)

```
99:
PLT "6, ALLOY";
GTO "I"⊢
100:
PLT "7, DIFFUSED
 MESA";STP ⊢
101:
"J";LTR 7.2+X,B,
122;X+.15→X;A+1→
A;JMP A⊢
102:
PLT "1, D03";
GTO "J"⊢
103:
PLT "2, D04";
GTO "J"⊢
104:
PLT "3, D05";
GTO "J"⊢
105:
PLT "4, D07";
GTO "J"⊢
106:
PLT "5, D013";
GTO "J"⊢
107:
PLT "6, D014";
GTO "J"⊢
108:
PLT "7, D029";
GTO "J"⊢
109:
PLT "8, D035";2.
6→B;.15→X;GTO "J
"⊢
110:
PLT "9, D041";
GTO "J"⊢
111:
2.6→B;PLT "A, AX
IAL";GTO "J"⊢
112:
PLT "C, A1";GTO
"J"⊢
113:
PLT "D, TO18";
GTO "J"⊢
114:
PLT "E, THREAD";
GTO "J"⊢
115:
PLT "F, MISC.";
GTO "J"⊢
116:
PLT "H, CASE 1";
GTO "J"⊢
117:
⊢
118:
END ⊢
R1102
```